Title: PLASMA BETA ENDORPHIN DURING CARDIAC ANESTHESIA: HALOTHANE VS FENTANYL

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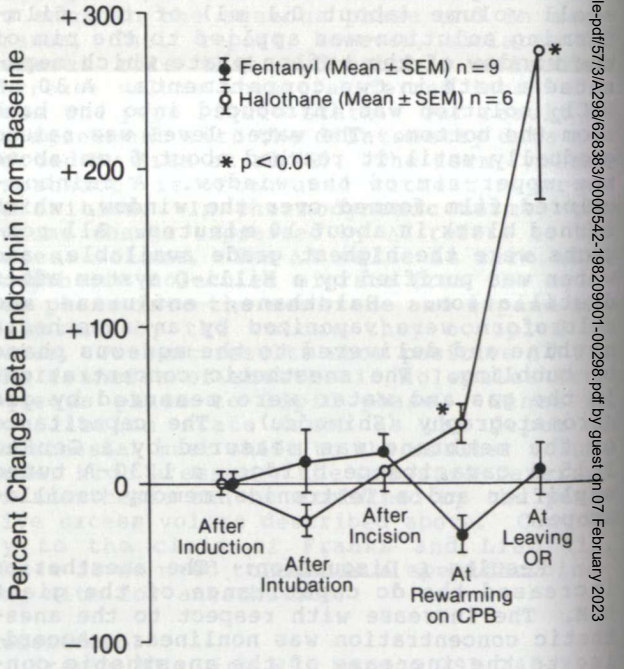
Introduction. Plasma beta endorphin activity is elevated by surgical stress.[1] As measured by catecholamines and renin, surgical stress response is ablated by both halothane and fentanyl, but growth hormone response, another index of stress response, is significantly higher with halothane as compared to fentanyl for cardiac anesthesia.[2] The purpose of this study was to examine the comparative effects of fentanyl and halothane on beta endorphin immunoreactivity during cardiac surgery and cardiopulmonary bypass.

Methods. With informed consent and approval by the Human Subjects Committee, 15 male patients scheduled for coronary artery bypass graft surgery were studied. Premedication consisted of 0.4 mg scopolamine and 0.1 mg/kg morphine i.m. Patients were randomized to receive either halothane or fentanyl for cardiac anesthesia. Halothane induction was accomplished with 60% nitrous oxide and 0.5 to 4% halothane, and anesthesia maintained with 0.7 to 1.5% halothane. Fentanyl induction and maintenance dose was at least 50 micrograms/kg. Transtracheal anesthesia with 4 ml of 4% lidocaine was administered prior to tracheal intubation in both groups, and up to 30 mg diazepam was given to each group prior to cardiopulmonary bypass (CPB). During CPB, no halothane was administered to the patients. After CPB, halothane was administered again to the halothane group as tolerated by each patient. Blood was drawn for plasma beta endorphin after all lines had been placed (baseline), after induction of anesthesia, after intubation, after incision, at rewarming on CPB, and when the patients were leaving the operating room for the cardiothoracic intensive care unit (CTICU). Other dependent variables measured at the same times blood samples were drawn included patient temperature, systolic and diastolic blood pressures, and heart rate. Plasma beta endorphin immunoreactivity was determined using a New England Nuclear radioimmunoassay kit. Student's t-tests for grouped data and for paired data were used with significance defined at $p<0.05$.

Results. Of the 15 patients studied, 6 received halothane, and 9 received fentanyl anesthesia. Average age was 57±2 yrs (SEM), average weight 82±4 kg, and average height 178±2 cm. Average pump prime was 1.7 liters Lactated Ringer's, and average pump flow was 3 liters/min. Average anesthesia time was 278±8 min, average CPB time was 83±5 min, and average diazepam dose was 18±2 mg. There were no significant differences between the fentanyl and halothane groups for any of the above variables ($p>0.05$). The figure illustrates the percent change in plasma beta endorphin levels as compared to baseline. Levels in the fentanyl group did not change significantly from baseline at any of the measurements taken ($p>0.05$). Levels in the halothane group did not change significantly after induction, intubation, or incision, but did increase significantly on CPB, and were significantly higher than with the fentanyl group on transfer to the CTICU ($p<0.01$). Temperature, systolic and diastolic pressures, and heart rate were not significantly different between the fentanyl and halothane groups at any of the measurements taken ($p>0.05$).

Conclusion. These results agree with those of Dubois, et al[1] in that plasma beta endorphin was not elevated after induction of anesthesia. However, that group found elevated beta endorphin resulting from surgical stress alone, and our results show no elevation in plasma endorphin after incision. The results of the present study provide additional evidence linking beta endorphin and stress response of the hypothalamic-pituitary-adrenal axis. Marked elevation in beta endorphin levels with halothane patients on CPB and after bypass indicates that the halothane group did not have sufficient anesthesia to ablate the stress response as measured by plasma beta endorphin level.



References.

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2. Zurick AM, Urzua J, Estafanous FG, et al: Hemodynamic and hormonal effects of high dose fentanyl vs halothane for cardiac anesthesia. Anesthesiology 55: A248, 1981